Dick Chapman . . . Michigan Organist and Engineer
(See article, p. 5)

STACKS

December, 1961

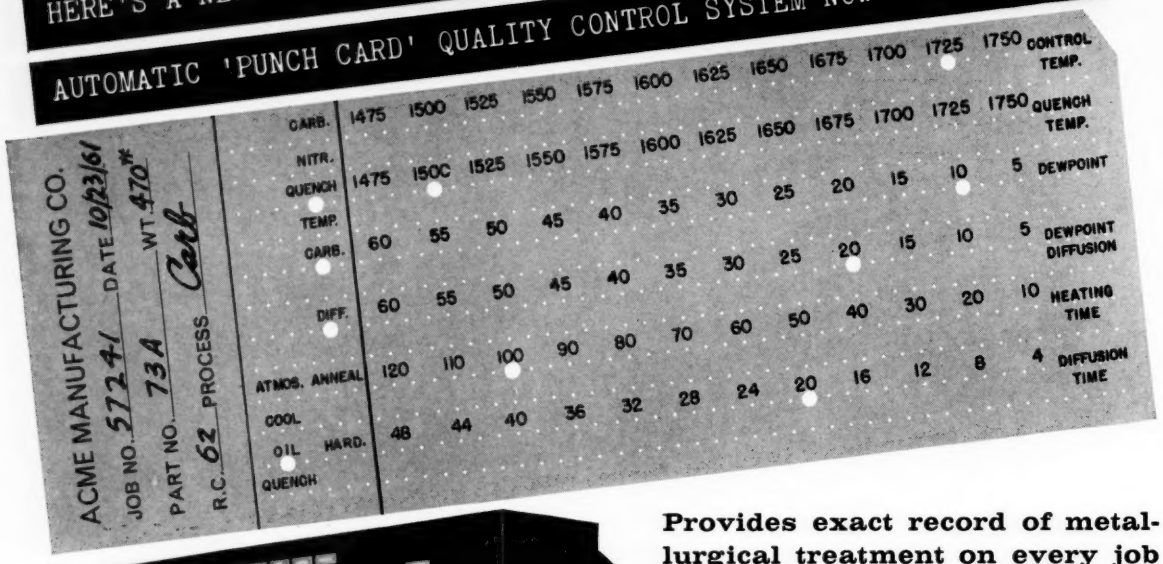
MR

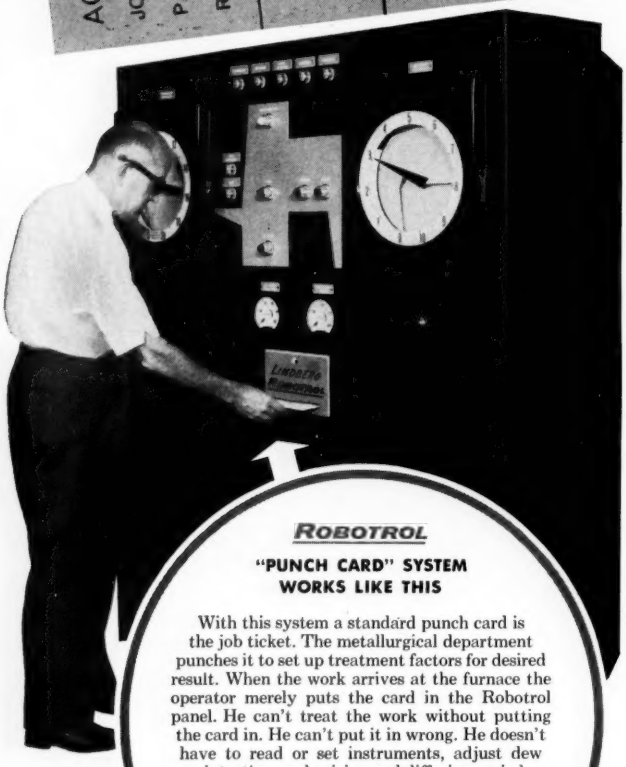
METALS REVIEW

The News Digest Magazine

HERE'S A NEW CONCEPT IN HEAT TREATING TECHNIQUE.

AUTOMATIC 'PUNCH CARD' QUALITY CONTROL SYSTEM NOW PERFECTED.





ROBOTROL

"PUNCH CARD" SYSTEM WORKS LIKE THIS

With this system a standard punch card is the job ticket. The metallurgical department punches it to set up treatment factors for desired result. When the work arrives at the furnace the operator merely puts the card in the Robotrol panel. He can't treat the work without putting the card in. He can't put it in wrong. He doesn't have to read or set instruments, adjust dew points, time carburizing and diffusing periods, decide on type and timing of quench. The punch card controls these automatically. It can provide for a variety of operations and required cautionary procedures. As the work moves on and is completed the punch card provides a permanent record of the exact treatment given it.

Provides exact record of metallurgical treatment on every job

System completely eliminates factor of furnace operator error

LINDBERG ROBOTROL

Guarantees you precise uniformity and quality in heat treating

Introduced at the recent ASM Show at Detroit, this new Lindberg Robotrol automatic quality control system has been in development for more than five years. With this punch card system pyrometers, timers, atmosphere control instruments and all the factors on which metallurgical results are dependent are set up and automatically controlled. It is practically impossible for the furnace operator to treat the work improperly.

The punch card also provides an exact record of the treatment given each job. You know exactly what happened.

The Robotrol system is extremely flexible and can be adapted to any kind of heat treating cycle. For full information get in touch with your local Lindberg Field Representative (see your classified phone book) or write us direct.

LINDBERG ENGINEERING COMPANY
2480 West Hubbard Street, Chicago 12, Illinois

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, Spain, Switzerland and West Germany.

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METALS REVIEW

The News Digest Magazine

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The Editor's Page

In this era of increasing complexity, communication lines become vital. Without them our entire economy could become hopelessly bogged down in utter confusion. Even with good lines of communication established we are likely to encounter some difficulties, particulary when communications are through the written word. These ruminations have been stimulated by several recent conversations.

One of our problems is that of word meanings. Take the word "technical". What impression does this supposedly simple word create in your mind? From where you sit, technical might mean anything from simple instructions for operating a gadget to the complex computation of a research scientist or engineer. For this reason, surveys on the desirable technical levels of books, magazines, lectures, seminars or what have you are often quite meaningless. How technical is "technical"?

The dictionary doesn't help much either. One portion of its definition of technical indicates that the word means the language of any trade, profession or sport. Perhaps a precise definition is needed, but I, for one, will not volunteer for the assignment.

We're not forgetting the battle which still goes on in some quarters over the development of a definition for metallurgy which is acceptable to all branches of the field.

More in Education

Metallurgical education recently received a substantial boost at the University of Denver. The boost came through a $300,000 grant to endow a professorship to be known as the Brainerd F. Phillipson Chair of Metallurgy in the University's College of Engineering. The gift came from the American Metal Climax Foundation, Inc., and the families of Walter and Harold Hochschild and Carl M. Loeb, Jr., of New York City.

Career Guidance

Individuals or groups devoted to career development in youngsters will be interested in a new booklet available from Battelle Memorial Institute. It is titled "Is There a Future Scientist or Engineer in Your Home". The booklet is really a guidebook for parents who are, according to many experts, much greater influences over the careers of their children than many of us imagine. Covered in the booklet are such points as how to determine characteristics in a child which indicates an aptitude for science or engineering, necessary high school courses and financial assistance.

There Is a Difference

We were happy to note, in reviewing the booklet mentioned earlier, that recognition was given the fact that although there are certain overlapping areas, engineering and science are two separate and distinct fields. Too often lately, science is given credit which actually belongs to engineering. There is a world of difference between making a scientific discovery, or proving out a new theory, and translating the discovery or theory into something practical.

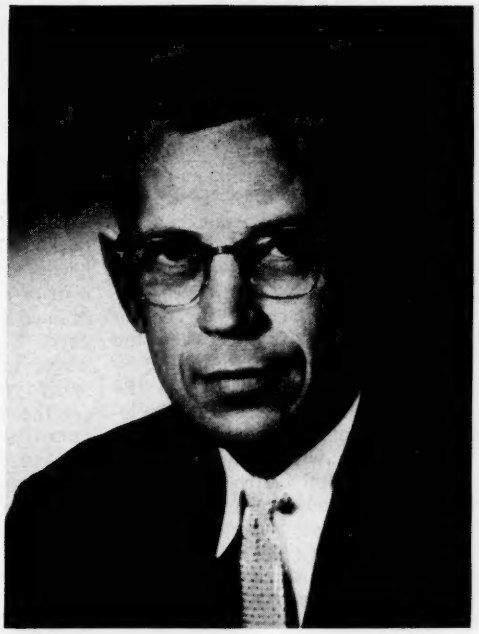
Metal Congress

In retrospect, we at ASM consider the recent Detroit Metal Show and Congress an outstanding success. One criterion on which this judgment is based is the fact that at various times nearly every event was oversubscribed in attendance. The first thing on Monday morning of Metal Show week found such a crowd at the Transactions' paper session that it became necessary to seek a larger meeting room. The same problem became felt several times over during the week. As a matter of fact, many who failed to heed a warning to purchase dinner-dance tickets early were disappointed because the affair was a sell-out. Several things, including the good line-up of programs, created the heavy interest.

The proximity of meeting rooms to the Metal Show and the enthusiastic work of ASM members in the Detroit area were major factors. With the experience of this year as a warning, we are already making plans to provide larger meeting room facilities in New York, the scene of the 1962 Metal Congress and Show.

Dick Chapman

. . . *Michigan Organist-Engineer*



Members of ASM's Detroit Chapter, please take a good look at the front cover. Whether or not you realize it at first, it pictures one of your well-known associates, a former chairman of your Chapter, in fact. Yes, indeed, that is Richard D. Chapman, a Chrysler engineer for 25 years and now Detroit representative for the Copper and Brass Research Association—but in an unfamiliar role. For those who are wondering about his pose, he is sitting at the console of his own theater organ as he, judging from his perplexed expression, apparently searches for the lost chord.

Actually, he won't be able to find that chord for quite a while since he is still rebuilding this organ (in his basement, incidentally). In about a year, though, watch out. Dick, as the owner and operator of a theater organ, is the possessor of what is probably the world's noisiest indoor hobby. When in full voice, instruments of this sort have been said to shatter windows and shake the shingles off the housetops. Originally devised to supply incidental music and sound effects for silent pictures, theater organs are equipped with varieties of stops which allow them to imitate almost every musical instrument, from a piccolo to a tuba. Some even simulate the human voice (through the use of a stop called the "vox humana", by the way). As for sound effects, these "musical" instruments are provided with auxiliary noise makers such as drums, xylophones, castanets, and all types of bells, including doorbells, gongs and those found in church carillons. When in command of such an instrument, the performer is virtually a one-man band, in fact, can probably become a circus parade including the crowd lining the street.

But enough of Dick the Organist, what can we say about Dick the Engineer? Quite a bit, as a matter of fact. Born some 46 years ago, in Detroit, he attended grade and high schools in that city, graduated and enrolled at Michigan State, then a college. During the ensuing four years he managed to do more than merely earn a bachelor's degree in chemical engineering. As a matter of fact, he met his future wife, Patricia, while serving as a waiter at the sorority to which she belonged. (Though a fraternity man [Phi Kappa Tau], he, like many others during the 1930's, found it necessary to work while attending school).

Immediately after leaving the college in 1937 he began his quarter-century career at Chrysler—but as a graduate student, surprisingly. To explain, at that time the well-known auto builder was operating its own educational facility, the "Chrysler Institute of Engineering". Its curricula consisted of courses planned so as to familiarize the incoming college graduate with industrial operations involved in auto manufacture. At any rate, Dick enrolled at the "Institute", studied and worked hard, and two years later, in 1939, received his master's degree in mechanical engineering.

His long rise through the ranks of the Chrysler organization then began, during which he served with distinction in several capacities. Throughout this period, his assignments concerned much work of a laboratory nature including metallography, X-ray diffraction, dilatometer studies and other such investigations. With time, more responsibilities came Dick's way until, in 1956, he was appointed managing engineer of Chrysler's Metallurgical Research Department. In this capacity, he was in charge of all research activities in ferrous and nonferrous metallurgy. Still more promotions were to come. The following year he was named assistant chief engineer of that department, and 1959 saw his promotion to assistant chief engineer of Basic Science Research for the Corporation.

It must not be thought that Dick's time was entirely bound up with his work. Throughout his

career, he has had many "extra-curricular" activities. True, much of his spare time was taken up with technical society work. Aside from important posts in ASM (he is now on the Technical Council and the Advisory Board of *Metal Progress*), he has held chairmanships and vice-chairmanships at both local and national levels in the American Institute of Mining, Metallurgical and Petroleum Engineers, the Society of Automotive Engineers, and the American Society of Testing Materials. (Not the least of the technical groups of which he is proudly an active member is the "Cafeteria Institute of Technology", a semi-official group of Detroit metallurgists which meets once a month in a local bistro—to discuss mutual engineering problems, he claims fervently.) Along with these society activities, he has been involved in the authorship and presentation of several technical papers on metallurgical subjects.

However, in addition to all of these professional interests, he has been able to devote effort and time toward acting as a semi-professional magician as well as in his previously mentioned operations in the theater organ field. Incidentally, with regard to the latter, he is a member of the American Theater Organ Enthusiasts, a group devoted to maintaining interest in the theater organ as an item of authentic Americana. Also, to keep up his skills as an organist, he is active in a local society composed of Hammond organ performers. Once a month, this group meets and each member gives a private organ performance. The critique that follows prepares him of the day when the "monster" in the basement will be revealed to the world.

Under such circumstances, it is easy to see why the Copper and Brass Research Association chose Dick as their representative in their newly established Detroit office. A man of so many and varied talents is hard to find. As for Dick, he regards his new position as a challenge, and is looking forward to many years of rewarding service for the Association. This is how he puts it—"What better way is there to earn a living than to call on one's friends—and, among other things, to discuss the use of copper and its alloys in autos". We and CABRA certainly agree with him, and wish him the best of luck.

Houston Conference Program Announced

Panel discussions on "Plastics Versus Metals" and "Castings Versus Forgings Versus Weldments" will highlight the new ASM Regional Conference and Exhibition in Houston, Apr. 17-19, 1962.

Preliminary program for the conference has been announced by Lamar J. Vieaux, chairman of the Texas Chapter. The theme of the event, "Materials and Materials Processing for the Petroleum, Petrochemical and Chemical Industries", will be stressed in terms of cutting costs, improving quality and increasing productivity.

"Materials to Answer Industry's Challenges", "Corrosion—Its Causes and Cures", "Solutions to Metal Joining Problems", "New Techniques in Metalworking" and "Cost-Cutting Testing and Inspection Techniques" are other topics.

A projected 21 papers will be presented in seven sessions under the co-sponsorship of ASM and the Texas Chapter. It will be the first ASM educational event designed specifically for a group of industries within a particular region.

As technical papers are being formulated, the Shamrock Hilton exhibit hall is filling up with reservations from companies relating to the exhibition's theme. To date, according to William J. Hilty, ASM exposition manager, over 50 companies have made reservations.

The preliminary program announced by Vieaux is as follows:

Tuesday, Apr. 17

9:00 a.m.—**Plastics Versus Metals** (Panel Discussion)

10:30 a.m.—**Castings Versus Forgings Versus Weldments** (Panel Discussion)

1:30 p.m.—**Materials to Answer Industry's Challenges**
- Materials for Ultra-High Temperatures
- Materials for Ultra-Low Temperatures
- What's New in Materials

Wednesday, Apr. 18

9:00 a.m.—**Corrosion—Its Causes and Cures**
- Corrosion in Carbon and Low-Alloy Steels
- Corrosion in Stainless Steels
- Corrosion in Nonferrous Metals

1:30 p.m.—**Solutions to Metal Joining Problems**
- Aluminum Welding
- New Techniques in Joining
- Mechanical Joining

Thursday, Apr. 19

9:00 a.m.—**New Techniques in Metalworking**
- High Energy Forming
- New Forging Techniques
- Chemical Milling and Electrospark

1:30 p.m.—**Cost-Cutting Testing and Inspection Techniques**
- Mechanical Inspection
- Ultrasonic Testing of Gas Line Piping
- Failure Analysis

ASM CALENDAR OF NATIONAL AND REGIONAL CONGRESSES AND CONFERENCES

Jan. 19, 1962—Florida Regional Conference, Orlando, Fla.

Feb. 15-17, 1962—Golden Gate Metals Conference, Fairmount Hotel, San Francisco, Calif.

Apr. 4, 1962—Tri-Chapter Meeting, "Technology of Metals in Sheet Form", Columbus, Ohio.

Apr. 14, 1962—Indiana Symposium, Purdue University, Lafayette, Ind.

Apr. 17-19, 1962—Conference and Exhibition: "Materials and Materials Processing for the Petroleum, Petrochemical and Chemical Industries", Shamrock-Hilton Hotel, Houston, Tex.

May 3-4, 1962—Southern Metals Conference, Clemson, S. C.

May 11, 1962—New England Regional Conference, Boston, Mass.

June 7-9, 1962—Pacific Northwest Metals Conference, Seattle, Wash.

Oct. 29-Nov. 2, 1962—National Metal Congress and Exposition, Hotel Biltmore and Coliseum, New York, N. Y.

. . . "Technological Progress Is Stimulated by ASM Activities"

George M. Humphrey*

I deeply appreciate receiving this award because my entire life has been spent working toward the objectives of your distinguished Society. Primarily, I have been engaged in the discovery and development of the material for the metals to which your activities are mostly directed—the iron ore and other ores from which all metals derive. But for many years I have also been interested in the intermediate steps, recovering metal from those ores, refining it and finding improved uses for these metals and alloys.

Technological progress, which you have been so instrumental in promoting, has never been so important as it is today. Long ago, metals were relatively simple products of mining, refinement and fabrication. Today, alloys are called upon to do jobs that surpass yesterday's wildest dreams, and yet they are jobs that must be done. The metals to do them must be produced, not only for use in our daily life, but also for the protection of our very lives.

These things require all the imagination and inventiveness that we possess. This applies not only in rocket, missile and atomic developments, but throughout the spectrum of industry. Your stimulation of the imagination and activity of the members of your organization — witness the fine awards made here tonight—is an inspiration to all of us.

Immediate Past-President William A. Pennington, left, shown at the speakers' table with Mr. Humphrey while he made his acceptance speech

The Auto Industry

The automotive industry illustrates the demands for progress in metals technology, and the response to that demand presented to the public year after year as new models. Aside from small quantities of glass, fabrics and plastics, the automobile is practically all metal—including steel, iron, aluminum, copper, lead, zinc, chromium and many others. The tremendous improvement in automobile performance has been due not only to the ability of automobile designers and engineers but also to the great ability of metals producers to supply new and improved materials.

Illustrations of this are almost limitless, and you in this audience can bring many such accomplishments to mind. I am sure that many of you have dreams of future developments in your minds right now that will be perfected and become broadly useful in the future. Technology is progressing rapidly, not only in the form and substance of the metal itself but also in the tools for accomplishing that development. Two or three illustrations are very close to home for me.

A hot strip mill is being broken in at the Great Lakes Steel plant a few miles down the river from here. It is, at least temporarily, the fastest, most powerful strip mill ever built. Computer controlled, it is automatic from one end to the other. We call it the mill of the future and it will produce wide, flat-rolled steel in tremendous volume. The uniformity of gage and width with improved surface will set new standards of quality in the industry.

In the last few months a new member in the family of steels has been developed. It is a mild carbon steel with columbium added. It retains the weldability of mild carbon steel but is much stronger in proportion to weight, thus providing greater economy in a wide range of finished products.

The Steel Industry

Throughout the steel industry, a new product is coming into commercial use. It is thin tinplate, which is lighter, more economical and will enhance the competitive position of tinplate producers, can makers and food processors.

There is in this search for new and better uses of metals to benefit man a matter of the greatest importance to all of us. We live in a highly competitive world. Technological progress is not confined to the United States. We are in a world-wide race for better goods of higher quality at lower cost. New techniques in many fields require new materials and new quali-

* *Excerpts from speech made by Mr. Humphrey on receiving ASM's Distinguished Life Membership at Detroit, Oct. 23, 1961.*

ties in old materials for new accomplishments. No one thing is of more importance in preserving our competitive position in the world than rapid progress in metal technology; indeed, in providing the protection for our very lives and our way of life in the contest of conflicting ideologies in the world today. The winner of the race here, as elsewhere, will be to the swiftest, and your stimulation and inspiration in all segments of this field are of the utmost importance.

The most important man in the world is a customer, and the most important thing is a job in America. Jobs, more and better jobs, don't grow on trees! They are created by the ingenuity and organization of men, making better things for our comforts and for the protection of our lives. Productive jobs pay for everything we have, for the maintenance of our families, for our education, for the increasing services we require and for the maintenance of the Government. Our way of life, our freedom of choice, the maintenance of our cherished ideals all depend on the maintenance of a sound and profitable economy. Financial responsibility of citizens and Government alike is essential to a national climate favorable to maximum growth in production and distribution.

You in the American Society for Metals have a great and an imaginative job to do; I am proud of this award and of my association with your successful effort.

1962 Metal Show Scheduled for New York

Advances in American industry and technology will be on display for thousands of visitors from home and abroad at the World Metal Show, Oct. 29-Nov. 2, 1962, in New York's Coliseum. It will be the first American Society for Metals exposition in New York City in 28 years.

In giving the Metal Show an international personality for 1962, ASM points to the show's location in New York as the gateway to world trade and headquarters city of the United Nations.

According to Allan Ray Putnam, managing director of the Society, the "world" theme will be expressed in terms of visitors from throughout the world. Exhibits, he stressed, will continue in the materials and materials processing direction begun in 1960 and expanded in 1961

FIRST NEW YORK METAL SHOW IN 28 YEARS *is made official by Mayor Robert Wagner of New York (2nd from right) and Allan Ray Putnam (center), managing director ASM. The event, to be known as the 1962 World Metal Show and National Metal Congress, will take place in New York's Coliseum. Others, from left, are Howard Sloane, Coliseum managing director, Arthur Smadbeck, Coliseum president and, far right, William J. Hilty, ASM exposition manager*

when more than a score of metals companies exhibited in the recent Detroit National Metal Show.

For New York, exhibiting companies will be urged to staff their displays with technical experts from this country and to invite participation of their consultants and representatives from foreign countries.

On the basis of requests already received for exhibit space in the show, ASM's exposition manager, William J. Hilty, anticipates that upwards of 400 companies will exhibit. More than 20,000 executives and engineers in the metalworking industry are expected to attend.

Educational focal point of the event will again be the ASM Materials Application Center, expanded to include many more materials, parts and components and geared to answer the question "What Material Shall I Use?"

Concurrently with the World Metal Show, ASM will present its 44th National Metal Congress. Many related societies will join with ASM in presenting technical sessions, panels and seminars.

PARTICIPANTS IN THE ONE-WEEK COURSE *on "Principles of Heat Treating" sponsored by the ASM's Metals Engineering Institute, included, stooping, from left: John E. Pettit, U. S. Pipe & Foundry Co., J. Clyde James, B. F. Goodrich Aviation Products, David L. Freed, Cann & Saul Steel Co., Roy J. Beckley, Carondelet Foundry, and Leroy L. Kelly, Koppers Co., Inc. Standing are, from left: Harvey G. Savage, Modern Steel Treating Co., Edward Comisky, SKF Industries, Inc., Alphonso Rucinski, Selas Corp. of America, Henry Travis, SKF Industries, Inc., Robert Donnelly, General Steel Industries, Robert W. Richardson, Philadelphia Naval Base, Air Material Center, Lewis W. Berger, training director, and Anton Brasunas, director, MEI*

Ultra High Strength Alloys

"A Forward Look at Ultra High Strength" was presented by J. C. Hamaker, Jr., director of research and metallurgical engineering,* Vanadium Alloys Steel Co., at a meeting in **Pittsburgh.**

Dr. Hamaker traced the strength trends in metallic materials over the past 20 years and described the currently available high-strength alloys. By World War II ultra-high-strength steels in aircraft parts were achieving about 180,000 psi. The late 40's produced strengths of 220,000 psi. in steels containing silicon and 4340 entered the aircraft picture at the 260,000 psi. level for landing gears and other selected parts. Currently, 280,000 minimum psi. is being used fairly extensively in production aircraft with the 300,000 and 325,000 psi. levels being explored. The accelerated development of these ultra-high-strength steels over this period have been stimulated by aircraft and missile requirements.

Use of high-strength materials has been extended as the designer has learned to avoid stress concentrations and the fabricator has improved fabrication and inspection methods to reduce flaws to an absolute minimum. Strength properties of currently available materials were summarized for use both at room and elevated temperatures. Particular mention was made of the new beta titanium alloy and the potential of newer metals, such as beryllium and the refractories.

The speaker presented an up-to-date look at the current ultra-high-strength steels along with some of the typical applications. Included in these steels were the numerous modifications of the 4340 or 4140 grades which are tempered in the 400-700° F. range. Relative advantages of this group are low heat treating temperatures, minimum cost and good fabricability. Another group contained the secondary hardening types of steels which have medium alloy contents, can generally be air hardened from higher temperatures and have the interesting characteristic of secondary hardening. Finally, we have the dual-purpose materials which include the semi-austenitic and precipitation hardening stainless steels and the aforementioned titanium alloys. A few representative applications are aircraft fasteners, hydraulic systems, landing gears and tail frame structures and the successful high-strength solid propellant rocket cases.

The area of notch toughness requirements was discussed at some lengths. The maximum useful strength attainable depends greatly on the type and severity of the notch involved. Very high strength levels have been used successfully in some critically stressed applications and higher strengths are being looked upon unfavorably from a sharp notch or crack test viewpoint. Some recent developments in notch and rocket case testing have indicated that extremely sharp notch testing results may not be as significant as at first indicated.

Several new methods of material evaluation that appear promising and which may help to supplement conventional and notch tensile testing are the bend test, which permits working at higher hardness levels beyond the present capability of the tensile test, and a technique of plotting true stress-strain curves of various materials under study that appear to lead to fundamental mechanical properties of a material.

New strengthening mechanisms that have entered into the field of ultra high strength also appear to be promising. These include the ausforming mechanism of hot working and heat treating simultaneously and the secondary hardening phenomenon in the field of martensitic steels. Among this latter field are several new materials containg 10-12% alloying elements and 0.50-0.55% carbon that are achieving 360,000 psi. by heat treatment and 460,000 psi. by ausforming. The 18% Ni-Co-Mo alloys developed by Inco are a significant breakthrough, achieving 250 and 300 ksi. yield strength with exceptional ductility and notch toughness.

Dr. Hamaker concluded by saying it now appears that extremely high strength levels are on the horizon. Decreased ductility or notch toughness will probably continue to be a problem. To take advantage of these strength levels, stress concentrations must be eliminated by extremely careful design, manufacturing and inspection procedures. *(Reported by H. M. Johnson)*

**Dr. Hamaker has since been named vice-president-technology (See Men in Metals, p. 13)*

R. M. Phillips, chairman, J. C. Hamaker, Jr., speaker, and L. G. Joseph, technical chairman, at a Pittsburgh meeting during which Dr. Hamaker discussed ultra-high-strength materials

Papers invited for . . .

Structure and Properties of Liquid Metals

The ASM Transactions Committee of the American Society for Metals is inviting papers to consider for presentation at its special session "Structure and Properties of Liquid Metals" to be held Nov. 2 during the 1962 National Metal Congress in New York City. Papers will be reviewed by the Transactions Committee for acceptance for presentation at this session and subsequent publication in *Transactions Quarterly.*

Manuscripts in triplicate, plus one set of unmounted original photographs and original drawings should be sent to the attention of John Parina, Secretary, Transactions Committee, American Society for Metals, Metals Park, Ohio. Papers to be considered for acceptance must be received at Metals Park by May 15, 1962.

The Care and Feeding of Technical Librarians

by F. L. LaQue*

Technical librarians may be assumed to be in a state of captivation. This should not be confused with captivity. Librarians are not ordinarily born in captivity and are rarely trapped or otherwise forced into library service. They are not even naturally wild, though they have been known on occasion to act as though they were. Such instances should not be misinterpreted as representing a reversion to an original state of wildness. Instead, as with many other species, a temporary manifestation of wildness is most likely to be induced by some sort of provocation or frustration. Even then, the condition of wildness is usually temporary. Permanently wild librarians are very rare indeed. Consequently, wild librarians will not be dealt with further.

The principal basis for regarding librarians as captivated is the fact that otherwise it would be difficult to account for their docility under trying circumstances. They must therefore, be captivated by the more favorable aspects of their existence, although these favorable aspects are surely of the spirit and rarely in the area of "creature comforts".

Give 'Em More Room

The nature of the librarian's tasks is such that the space required for them must inevitably increase, sometimes approaching a geometric progression. However, it does not follow that the space so required will expand at the same rate.

In the worst circumstances, the quarters assigned to librarians are left-over crannies after all other needs for space have been filled. By occasional coincidence such an allocation of space bears a reasonable resemblance to what is really needed. Such situations are likely to be of short duration since libraries established in remnant space rarely, if ever, have any room for expansion.

Since libraries, librarians, and what they do, continue to increase in importance and popularity, it is becoming more common to make provision for them in building plans. Consequently, the allocation of space in new buildings is likely to be more adequate, at least at the start. Nevertheless, the rate of expansion of the volume of things to be handled by librarians is inevitably greater than the planners are willing to recognize or able to get authorized. The usual result is that librarians have to become accustomed to living in crowded quarters. As a class, therefore, librarians have had to cultivate the ability to carry on their assigned tasks in cubby-holes and among stacks, under conditions that might reasonably be expected to lead to claustrophobia. Also, with their co-workers necessarily breathing down their necks, they have learned the virtues of tolerance and how to live without privacy. So far, there has been no indication that this acquired characteristic of librarians has led to their assignment to submarines or even space capsules. Perhaps still-secret plans for putting animals into outer space contemplate the use of librarians as the next step beyond the Soviet dogs and the U. S. monkeys. This, of course, would represent a shift in the

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*Vice-President, Manager, Development and Research Div., International Nickel Co., Inc., New York. Condensed from a talk presented before the Metals Div., Special Libraries Assoc.

basis of choice from expendability to adaptability since no one should feel that librarians are expendable—except in rare instances when the conditions of wildness previously referred to show signs of permanence.

There are two impending problems that are extremely popular subjects of discussion these days—the population explosion and the literature flood. Which danger will prevail? There is a chance, of course, that the tremendous accumulation of published matter will pre-empt the space required for an expanding population. One solution may be to relegate librarians and their hoarded literature to outer spaces where, by the miracles of modern communication, they can continue to discharge their important functions.

Food for Thought

Librarians have little choice of what is sent to them for nourishment. As a matter of fact, the nourishment of librarians is a very minor factor in determining what they receive. This is especially true of technical libraries. Technical librarians are required to deal with material covering an extremely broad range of quality. At one end of the spectrum are accessions of tremendous and permanent value. At the other end some of the material is little better than trash. Librarians are supposed to make the necessary distinctions and deal with the material accordingly. This is particularly difficult near the trash end of the spectrum.

Frequently, the people whom librarians serve find on their desks material of questionable future value. Rather than throw into the waste basket something that just might conceivably be wanted again, it is much easier to scribble "library" on the document and transfer the problem of disposal to the librarian. This recognizes the superior judgment of librarians but, at the same time, exposes them to risks of recrimination when, at some future date, an item that is discarded by the librarian, suddenly acquires value.

The donor runs no similar risks. If he never asks for the item, the fact of its disposal never becomes a matter of issue. If he does ask for it, he can assert that if he hadn't recognized its value in the first instance, he wouldn't have sent it to the library. The librarian is rarely in a position to challenge such assertions. Furthermore, the librarian is unable to apply the obvious recourse by storing everything since even the newest libraries do not have expandable rubber walls.

Tower of Bable

The problem is complicated further by the fact that simple storage is not enough. Possible retrieval must always be insured by appropriate indexing and guides to location. This requires as much attention to items that may never be heard of again as to material likely to be asked for frequently. So the librarian is called upon constantly to make decisions too difficult for the technical staff, with the continual risk of being scolded when the decision is wrong and with little expectation that a difficult, correct decision will be praised. A natural result is that librarians must develop a great tolerance for abuse and indifference to criticism. Even so, enough chinks usually remain in their armor to permit pain to penetrate under particularly aggravating circumstances. And despite their tough veneer, most librarians are sensitive to the warming effects of praise. Unfortunately, the incidence of praise is generally less than that of abuse, largely because praiseworthy behavior is expected of the librarian breed.

Technical librarians are generally associated with groups of specialists in many fields, each with its own jargon. They are supposed to be at home with all these dialects—not only able to read them, but translate them into abstracts intelligible to other nonspecialists. This subjects librarians to a very heterogeneous diet.

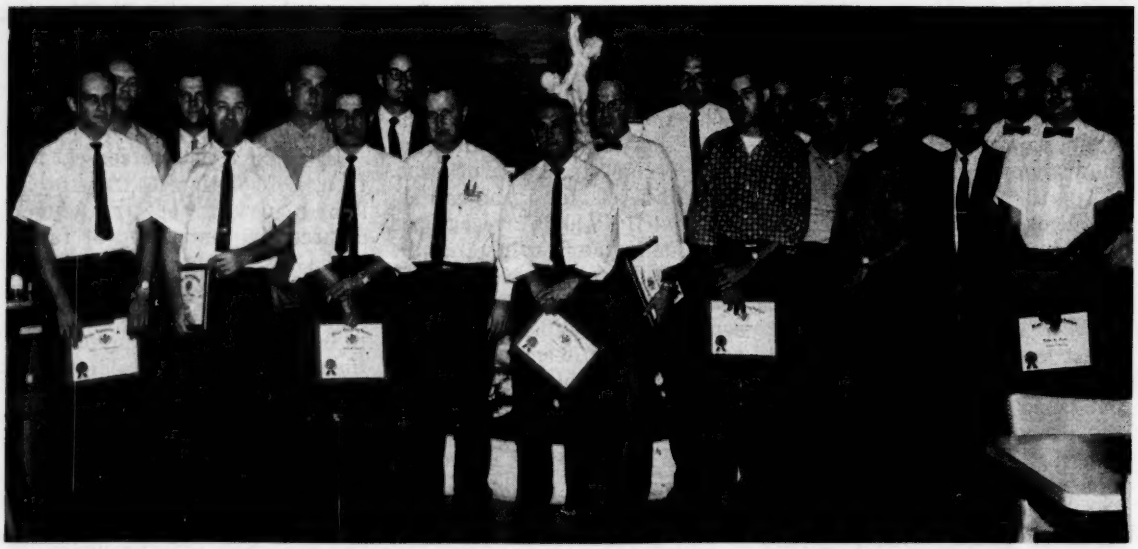
Can She Be Replaced?

In their constant search for foolproof solutions to these problems librarians face the danger of becoming entranced or fascinated by the beauty and challenges of indexing and filing schemes. Some have been known to make a sort of game of cross indexing. The object is to find the largest possible number of ways to combine words to describe a particular item and to produce a file card corresponding to each variation of the theme. For example, there was the file clerk who produced 23 index cards covering all possible ramifications of the time, place, subject matter, and other aspects of an invitation to give a technical talk—that had to be declined.

Librarians as a class are being subjected to the "peril" of automation. While the future may see mysterious electronic devices performing various important library activities, the machines are not likely to displace librarians in their most valuable functions. Someone will still have to have a great deal of knowledge and exercise fine judgment in feeding the monsters and interpreting what they retrieve. Another aspect of this matter is suggested by the couplet:

"Without any curves and without any curls
How could they replace so many nice girls?"

General recognition of the possible deficiencies in the care and feeding of librarians such as have been touched upon here could have effects beneficial to all concerned. Librarians can be expected to respond to TLC (tender loving care) by increasing their tolerance of mistakes and by serving their self-styled masters with even greater efficiency than they have demonstrated under conditions of unwitting, yet too frequent, torment.



Twenty men from Metals and Controls, Inc., Attleboro, Mass., who completed the MEI Course "Elements of Metallurgy" were, from left: K. Hammerschmidt, J. Bolster, O. Nietzel, guest lecturer, E. Buckley, B. Blake, D. Bannon, J. Medgyesy, W. Stanley, N. Boutet, T. Freeman, K. Schneider, J. Osborne, R. Stark, guest lecturer, R. McGovern, E. Wood, R. Gennone, guest lecturer, K. Clark, R. Malin, guest lecturer, and J. Binns, instructor. Students and guest lecturers not present at the time the photograph was taken were A. Barros, R. Farrell, F. Gayton, E. Sampson, W. Stevenson, J. Williams and lecturers G. Davis, S. Donelson, P. Lynch, G. Oyler, L. Sarkes and P. Trost

MEI Graduates Three Groups

Above: Cambridge Wire Cloth students who completed "Corrosion" course were, seated: H. L. Brannock, T. W. Hurley, J. M. Bailey, D. E. Andrews, discussion leader, and standing: G. E. Cannon, O. P. Ross, J. E. McKnett, W. I. Pink and J. C. Applegarth. Right: "Elements of Metallurgy" students from United Engineering and Foundry Co. were, seated: G. L. Tarbet, G. N. Moorhead, R. W. Coleman, H. W. Fryman, D. A. Ritchey, and standing: R. D. Klitz, C. C. Miller, L. W. Berger, MEI training supervisor, T. H. Hill, and J. E. Guest. Not present: H. P. Ballard, K. C. Garside

MEN in METALS

Directors of the Vanadium-Alloys Steel Co. have elected L. D. Bowman to the position of Chairman of the Board and George A. Roberts president and chief executive officer. Bowman and Roberts will fill posts vacated by the sudden death of James P. Gill (see Obituaries), former head of the firm. The directors also named John C. Hamaker, Jr., to succeed Dr. Roberts as vice-president—technology.

Mr. Bowman, who first joined Vanadium-Alloys in 1917 as a chemist, has been vice-president of production since 1945. He served as plant metallurgist from 1920 to 1928 when he became works manager. In 1955, he was elected to the Board of Directors.

A native of Ebensberg, Pa., he attended Wooster College and Jefferson Medical College. During World War I he served as a private in the U.S. Army.

John C. Hamaker, the newly elected vice-president—technology, joined Vanadium-Alloys in 1953 and was advanced to manager of the research department two years later. He was appointed director of research and metallurgical engineering in 1959. He headed an active program of new high-speed and toolsteel development and testing simultaneously with an intensive research project designed to meet space age requirements for structural steels. His new steel developments have earned him several patents.

Dr. Hamaker, 37, was born and raised in the Canton-Massillon, Ohio, area. He received his B.S. degree in metallurgical engineering (1945), M.S. (1947) and Ph.D. (1952) from the University of Michigan. He has worked for the International Nickel Co., Rotary Electric Steel Co., Foundry Services, Inc., and the General Iron Works Div., Stearns-Roger Manufacturing Co. During World War II he was a fighter-director officer in the USNR.

He is a member of ASTME's Handbook Committee, the Executive Committee for the Pittsburgh Chapter ASM, chairman of the American Standards Association Committee on Solid Single Point Tools and the AISI Subcommittee ANC-5 on aircraft steels.

He is currently on the Materials Advisory Board Standing Committee reviewing the Department of Defense Research and Development Program. He is co-author of the forthcoming ASM book "Tool Steels" and of an ASM Metals Engineering Institute text on the subject. Other affiliations include AIME, SAE, several Greek letter societies and he is an American Man of Science.

Dr. Roberts, the new president, has been associated with Vanadium for 21 years. He began his service as a research metallurgist and in 1945 was named chief metallurgist. He became vice-president—technology in 1953. He was president of ASM in 1954-1955, and the following year served as president of the ASM Foundation for Education and Research. In the same year the Pennsylvania Junior Chamber of Commerce named him one of the three outstanding young men of the year.

The internationally known steel executive also served four terms as president of the Metal Powder Industries Federation. He organized and is chairman of the Metallurgy-Ceramics Foundation. His interests and associations include membership on many governmental and technical panels and boards. He is a member of ASTME, AIME, AISI, ACS, Sigma Xi and Tau Beta Pi.

In 1956 he was elected to the Board of Directors of the Vanadium-Alloys Steel Co., and in 1959 a director of Vanadium-Alloys Steel Societa Italiana per Azioni. The same year the stockholders of the Allied Products Corp., Detroit, named him a director.

Dr. Roberts has delivered lectures on toolsteel, metal powders, ultra-high-strength steels, vacuum melted steels and other subjects to approximately 125 local chapters of ASM, ASTME and ASME. He has co-authored several metallurgical books and written many technical papers and articles.

Dr. Roberts received his B.S. degree from Carnegie Institute of Technology in 1939. In the next three years he completed graduate requirements at Carnegie for his M.S. and Ph.D. degrees.

• Kay M. Shupe has been named project metallurgist, toolsteel, at the Dunkirk Works of Allegheny Ludlum Steel Corp. Mr. Shupe came to Allegheny from Latrobe Steel Co. where he had served in various capacities for the past nine years.

• Edward H. Perkins, Jr., has been elected to the presidency of Brooks & Perkins, Inc. He had been executive vice-president and general manager.

• Robert P. Jones, New England division manager of Oakite Products, Inc., since 1954, has been assigned to the New York headquarters of the firm.

• Alfred F. Bauer has been appointed manager of the Doehler-Jarvis Division of National Lead Co. He joined the company in 1951 as assistant chief engineer of the research department at Toledo. The following year he became chief engineer of the division and in 1956 was named assistant general manager.

• Kenneth R. Daniel was elected executive vice-president of the American Cast Iron Pipe Co. He had previously held the position of vice-president in charge of engineering and purchases.

• Ernest F. Nippes, graduate of Rensselaer Polythechnic Institute and a member of the faculty since 1939, professor of metallurgical engineering since 1954, has been named by the provost as acting head of the Department of Materials Engineering. Dr. Nippes has been in charge of welding research at the Institute since 1949 and has won numerous honors for advances in that field. One of the most signal of these was the $2000 Teaching Award from the American Society

for Metals in 1956. Other prizes were awarded for leadership in various fields of welding research and for four years running Dr. Nippes and associates won the first prize of the American Welding Society for their work in resistance welding. He delivered the Adams Memorial Lecture for AWS in 1958 and in 1959 was awarded the Miller Medal for outstanding services in AWS.

Dr. Nippes has engaged in extensive research under sponsorship of metalworking industries. He recently returned from Russia where he was one of three American welding authorities invited to visit research centers in Moscow, Kiev and Leningrad. This visit was in return for the tour of three Russian welding experts to Rensselaer and other centers of the profession in this country.

He was 1947 chairman of the Eastern New York Chapter ASM.

• Richard M. Lord has been named chief metallurgist for the Cleveland works of Aluminum Co. of America. Since 1952 he has been chief metallurgist of the fabricating division of Alcoa's Tennessee operations. He joined Alcoa in 1939.

• E. S. Howarth, chief engineer of Alcoa Research Laboratories, has been appointed assistant chief construction engineer for Aluminum Co. of America.

• J. D. Reid has been appointed manager of aluminum sales for the Hill-Chase Steel Co. He has been in general sales for the past 10 years.

• Walter P. Huhn, Jr., has been appointed manager of metallurgical services for American Potash & Chemical Corp. He was formerly senior melting metallurgist with Crucible Steel Co.

• Peter Stefan, formerly eastern sales manager for Western Gold and Platinum Co., has been appointed sales manager for the Cannon-Muskegon Corp.

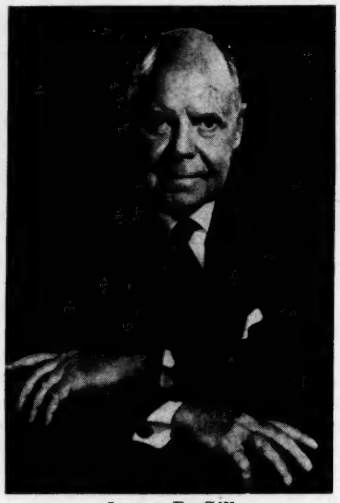
• Frederick T. Hedgcock has been named manager of the magnetics and semiconductor laboratory of the Franklin Institute Laboratories. He was formerly associate professor of physics at the University of Ottawa.

Obituaries

James P. Gill, nationally known steel executive, died suddenly on Oct. 30 at his home in Latrobe, Pa.

At the time of his death, he was chairman of the board and president of Vanadium-Alloys Steel Co. He was also chairman of the board of Vanadium-Alloys Steel Canada Ltd.

Dr. Gill was a past national president of the American Society for Metals (1940) and a trustee of ASM for several years. He was also a member of AIME, ASME, ASA, ASTE, AMA and the American and British Iron and Steel Institutes.



James P. Gill

He was a director of the Council of Profit Sharing Industries, vice-president of the Trade Relations Council, a past member of the Advisory Committee on Metals and Minerals of the National Academy of Sciences and National Research Council. At the end of World War II, he served as a member of the Foreign Economics Administration Committee to investigate the German steel industry, following which he published a detailed report for the U.S. Government.

Dr. Gill was born in Montgomery City, Mo., in 1896, and obtained his B.S. degree in metallurgy at the University of Missouri and his M.S. degree at Rolla School of Mines. He did further graduate study at Columbia University school of Mines in 1918-20. The University of Missouri honored him with a Ph.D. in 1946. After serving in World War I, he began his metallurgical career with Anaconda Copper Co. and joined Vanadium-Alloys Steel Co. in 1920. During his career, Dr. Gill authored several books on tool and special steels, including the first modern text on toolsteels, published by ASM in 1936 and now entering its third edition. Also, he was a past chairman of the Metals Handbook Committee. Dr. Gill patented many special steel compositions and delivered some 250 lectures throughout the United States.

● Phillip Pagliarulo, 36, a member of the New York Chapter and a World War II paratrooper, died in Veteran's Hospital Fort Hamilton, New York, on July 12. He was supervisor of the metallurgical laboratory for Grumman Aircraft Engineering Corp.

● Peter Payson, 63, assistant director of research, Crucible Steel Co. of America, died Nov. 26 after a prolonged illness.

Dr. Payson has been recognized as one of America's outstanding metallurgists. During his career he was granted 36 U.S. patents and was author or co-author of 17 papers in his field. Last June he was awarded an honorary doctorate of engineering by Stevens Institute of Technology for "his many achievements in the general field of metallurgy".

Dr. Payson served as Adjunct Professor of Metallurgy at Stevens' Graduate School from 1941 to 1955.

In 1958 he delivered the Campbell Memorial Lecture for the American Society for Metals, and in 1960 he delivered the Carnegie Lecture before the Pittsburgh Chapter ASM. At the time of his death he had just completed work on a new book, "Metallurgy of Toolsteels".

Peter Payson

A native of New York City, Dr. Payson joined Crucible in 1923 as a metallurgist at the Sanderson-Halcomb Works and in 1929 was transferred to the Research Laboratory where he was chief research metallurgist and later assistant director of research.

When Crucible established research headquarters at Pittsburgh in 1955, Dr. Payson moved there as manager of the Central Research Laboratory and assistant director of research. He relinquished administrative responsibilities in 1959 to devote his major effort to writing his text on toolsteel metallurgy, which is scheduled for publication next year.

● ASM Life Member Arthur Jefferson Boynton, active as a steel mill operator and engineer for 64 years, died this past August. His formal engineering education was obtained at Ohio State University, but throughout his long life he never ceased to continue to educate and inform himself of modern advances in almost every conceivable subject.

Mr. Boynton's activity in the steel industry started when he joined the Lorain Works of National Tube Co. as a chemist in 1897. During his 24 years of service with that company, he progressed to the position of general superintendent of the "Lower Works", which consisted of the coke plant, blast furnaces, docks and steelmaking department.

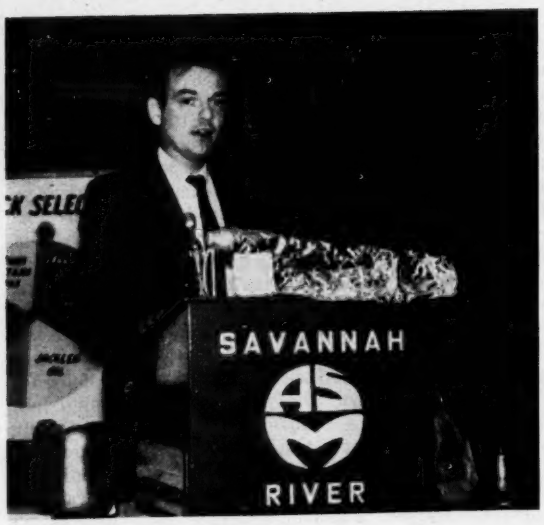
In 1920 he left National Tube to become vice-president and general manager of Woodward Iron Co., a position he held until 1924 when he joined H. A. Brassert and Co., steel mill engineers. During his 16 years with Brassert he rose to the position of operating vice-president. He had ample opportunity to observe steel mill operations abroad during that period and spent a considerable amount of time in England, Russia, Germany and other European countries.

In 1940, at the age of 64, he started his own organization, A. J. Boynton and Co., and actively headed it for 21 years until his death. Probably his greatest engineering achievements were attained during that period, crowned by the design and construction of the $90-million steel works and pipe mills at Lone Star Steel Co. He remained the steel mill consultant for Lone Star and was visiting that company on a new assignment at the time of his death.

Not many men achieve the distinction of becoming a life member of a professional society. Mr. Boynton became a member of five, including ASM, ASME, AIME AISE and the AISI. He was chairman of the Iron and Steel Section of ASME for two years as well as chairman of the Blast Furnace, Coke Ovens and Raw Materials Section of AIME. He was a member of long standing in the Eastern States Blast Furnace & Coke Assoc., the Western States Blast Furnace & Coke Assoc., and the Western Society of Engineers. He was also a member of the Illinois Mining Institute, the ASTM and the American Ordnance Assoc. In spite of his busy schedule, his preoccupation with engineering and scientific matters, Mr. Boynton found time and considered it his duty to take an active interest in politics and in the country's affairs.

ERNEST G. GUENTHER, SECRETARY *of the Milwaukee Chapter, each year holds a social evening at his home to entertain and reward the efforts of the Chapter's officers, committee members, and past chairmen. Ernie, who has served as secretary for the past 26 years, had the following past chairmen as guests this year. Top row, from left: W. W. Edens, Ernie, G. B. Kiner, E. Gammeter, J. M. Beyerstedt and N. P. Milano. Center row, from left: J. E. Schoen, M. A. Scheil, C. I. Wesley, C. A. Furgason and H. H. Zabel. Bottom row, from left: R. C. Onan, M. Evans, R. P. Daykin and S. L. Henry. Merill Scheil, the 1942-1943 chairman of the Chapter, is presently national secretary ASM*

Chapter



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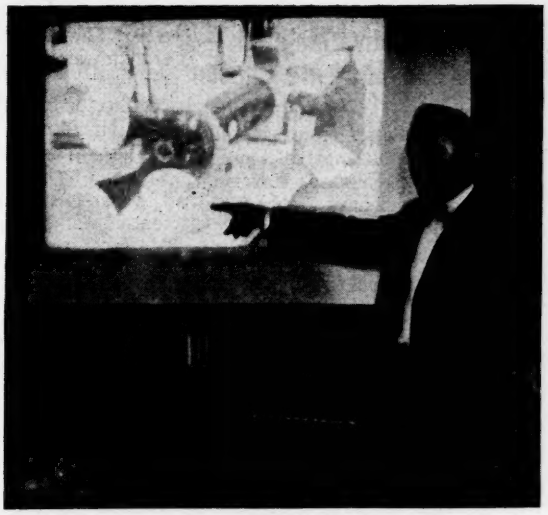

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1. Paul R. Kruesl, a vice-president of Vitro Chemical Co., presents a talk on "Practical Chemistry and Metallurgy of the Rare Earths" at a Savannah River meeting. 2. Henry Hausner, right, and John E. Hockett, chairman, at a Los Alamos meeting during which Dr. Hausner spoke on "Powder Metallurgy — East and West". 3. A. Scully, chairman, W. A. Pennington, past national president ASM, P. M. Howard, immediate past chairman, Bernard Collitt, 1937-38 chairman, and T. C. McConkey, 1930-31 chairman, during a meeting of the Montreal Chapter. 4. Officers and executive committee members of the Rochester Chapter include, front, from left: H. E. Johnson, Robert V. Adair, Robert B. Barrow, Russel Brush and Roger Butts. Back, from left: Eugene Pfeiffer, James Beachner, James H. Brown, A. R. Mancini, Edwin Pryor, Franklin Ernisse and Lacy Smith. 5. J. Allen Morris, project engineer, Arnold Engineering and Test Center, speaking before the Savannah River Chapter on "Testing Advanced Design Aircraft and Rockets". 6. "Man Made Diamonds" were described by Ray W. Guard, General Electric Co., at St. Louis. Shown, from left: public relations chairman Stephens, membership chairman Kick, vice-chairman Gulbransen and Mr. Guard. 7. M. S. Allshouse, left, retiring chairman of the Beaver Valley Chapter, presents silver certificate to N. L. Steinacker for 25-year membership. M. V. Herasimchuk, Bethlehem Steel Co., presented a talk entitled "Vacuum Degassing of Steel" at this meeting of the Beaver Valley Chapter

Automotive Materials—How They Are Chosen

At **Detroit** Chapter's educational program on "Selection of Metallic Materials for Automotive Applications", J. R. Forrester, Materials, Fuels and Lubricants Dept., Product Study Engineering Office, Ford Motor Co., gave the first lecture on the "Selection of Copper and Its Alloys".

The "ideal" part is based on the judicious selection of material and design to give proper function and appearance at lowest weight and cost. While weight is increasingly important, it is not the sole criterion. The strength of materials and their modulus of elasticity, as well as the ratio of modulus to weight, are factors in the decision of which metal to use. Other significant factors are price per pound or price per unit volume. The relationship of modulus to price is the reason why steel is used so widely for structural applications. Special requirements, such as heat conductivity or electrical resistivity, sometime take precedence over the common properties and cost. Cooling systems and electrical systems are typical of special applications which require copper and each accounts for roughly 40% of the total copper used. The remaining 20% is divided between parts such as bushings, tubing, radios, etc. Aluminum has been considered for these applications but presents problems in the areas of joining and corrosion. While copper might appear vulnerable on casual examination, its cost has limited it to essential applications. However, it is not losing ground in the same manner as some of its competitive materials.

R. Metzger, Cost Estimating Dept., Corporate Planning Staff, Chrysler Corp., spoke on the Selection of Aluminum, Magnesium and Zinc". Material specified on engineering drawings must satisfy manufacturing, service and economic requirements. Over 34 different aluminum alloys are specified for nearly 2500 different parts. In discussing the processing of aluminum, Mr. Metzger estimated that 85% of the aluminum castings used in passenger cars are produced as die castings. Permanent mold castings are specified only when special properties conferred by heat treatment are required. By means of slides, Mr. Metzger discussed the various kinds of die casting processes. The valve body for automatic transmissions was shown as illustrative of the complex designs readily produced by die castings, requiring little or no machining. While granting that 90% by weight of the aluminum used is in the cast form, there are still a great many stamped or extruded parts. Many of the stamped parts are of a decorative nature, are easily formed and bright finished at a lower cost than competitive materials. An increase in tool life because of the good forming characteristics of aluminum provides additional savings.

Zinc die castings are used most often for "hardware" items and are finished by plating or painting. Zinc is preferred for such applications because of the relative ease with which it can be chromium plated, particularly in comparison with aluminum and magnesium. If the parts are to be painted only, any of the three metals might be specified and would be determined on the basis of economics.

While aluminum is about one-third the weight of zinc, magnesium is only two-thirds the weight of aluminum. In addition, magnesium possesses definite mechanical properties in contrast to zinc. Applications, such as parts for convertible tops, might be an ultimate choice for magnesium, depending on cost.

R. E. Harvie, chief metallurgical engineer, Chevrolet Engineering Center, spoke on the "Speciality Nonferrous Metals". He admitted he was surprised by the list of metals submitted to him by his analysts. It included lead, chromium, nickel, cadmium, tin, platinum, poladium, ruthenium, tellurium, germanium, silicon, tungsten, silver, beryllium, indium and cobalt —all of which are used as principal elements, not merely as alloys. Mr. Harvie went on to discuss some of these metals and their applications, such as lead for storage batteries, chromium, nickel, cadmium and tin for electroplating, and platinum, etc., in electrical components. He estimated that an average car contains about 0.001 lb. platinum and that industry-wide a total of 6500 lb. is used annually. These metals are selected on the basis of corrosion resistance, temperature effect, weldability (not desired on make and break contacts), expansion and contraction, thermal and electrical conductivity, magnetic permeability and chemical properties.

J. R. Forrester, Ford Motor Co., spoke on the selection of ferrous castings, which account for about 20% of the total ferrous metals used. The five basic types of ferrous castings (gray iron, malleable iron, pearlitic malleable, nodular iron and cast steel) were compared on the basis of tensile strength, yield strength and elongation, as well as modulus of elasticity. These are selected on the basis of function, cost and weight. Gray iron is the work horse and is used for a wide range of parts, including cylinders, blocks, pump pulleys, covers, etc. Malleable iron is used where ductility is a requirement, such as door hinges and spring brackets. Pearlitic malleable is used where good strength,

SILVER CERTIFICATES *denoting 25-year membership and service to ASM were presented to the following Washington Chapter members during a recent meeting: William T. Sweeney, Glenn W. Geil and Hugh L. Logan, all from National Bureau of Standards, Past National President W. A. Pennington, University of Maryland, Lancaster Lowery, Naval Weapons Plant (retired), John A. Bennett, NBS, William E. McKenzie, Naval Weapons Laboratory, and Robert W. Mebs, NBS*

ductility and hardenability are required and include such items as valve rocker arms, truck spring brackets and tow hooks. Nodular iron provides a wide range of strength in combination with ductility. Some applications are crankshafts, differential gear cases and implement gears. Cast steels are specified where higher strengths are required, particularly for truck and tractor use.

Stuart M. Hansen, supervisor, Analytical Metallurgy Dept., Engineering Division, Chrysler Corp., spoke on the "Economic Selection of Wrought Steels". Cost is the common denominator which reduces the multiplicity of factors in making a material selection. Fundamentally, the material selected must satisfy both manufacturing processes and service requirements. Mr. Hansen discussed price base reference, metallurgical requirements, quality, government and association specifications, test requirements, inspection and dimensions and their influence on cost. Economic selection involves a highly integrated approach to assimilate information based on accurate design and performance requirements, manufacturing and fabricating procedures and equipment, sound metallurgy and a Philadelphia lawyer to interpret the company's pricing book.

Mr. Harvie, Chevrolet Division, General Motors Corp., spoke on the "Speciality Ferrous Materials", including stainless steels for decorative as well as heat resistant applications. Requirements such as bright, pleasing appearance, corrosion resistance and formability would lead to the selection of a stainless steel. There are still decisions to be made as to which stainless. Economics dictate the use of Type 430, but severe forming requirements might require a Type 301 or 201 with a chromium flash. Type 401 might be specified for fasteners as it can be heat treated to provide higher mechanical properties. The heat resisting grades are almost too numerous to count and are selected on the basis of ability to do special jobs. Material requirements for poppet valves were considered in detail. Sintered metals were then discussed, with typical mechanical properties included. *(Reported by G. F. Bush)*

CHAPTER BRIEFS

Welding techniques and practices used in Holland, France and Germany were illustrated by Clarence E. Jackson, associate manager, Newark development laboratory, Linde Co., at **Canton-Massillon.** Mr. Jackson also gave a brief illustrated description of a recent trip to Russia.

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An interesting trip, via color slides, through the South Pacific, was enjoyed by the members' wives at the Ladies Night Meeting held by the **Terre Haute** Chapter.

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Theories of diffusion in metals have advanced partly an understanding of the atomic movements resulting in diffusion but these theories still leave great gaps which must be filled in by further research, according to Charles A. Wert, University of Illinois, who spoke at a meeting in **Indianapolis.**

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De-emphasizing the technical aspects and underlining the practical approach to the prevention of failures in ferrous and nonferrous items produced by industry, Gerald Van Duzee, senior materials engineer, Sikorsky Aircraft Corp., speaking at **Milwaukee,** pointed out that failures in metal parts can be attributed to poor design, materials or processing practices.

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"Saturn Missile Materials Problems" were discussed at a **San Diego** meeting by William Lucas, chief of the Engineering Materials Branch of the George C. Marshall Space Flight Center.

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The nature of machined metal surfaces, how they are generated, their measurement and the limitations of various measuring instruments were covered by Arnold W. Young, manager, Division of Engineering and Scientific Instrumentation, Engis Equipment Co., at **Carolinas Northern Piedmont.**

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Fifty members and guests of the **Edmonton** Chapter heard John Pearson, senior research scientist and head, detonation physics group, U.S. Naval Ordnance Test Station, China Lake, Calif., discuss "Explosive Forming". Mr. Pearson presented this same talk at a meeting of the **Medicine Hat** Chapter.

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Induction heating equipment, its applications and some interesting sidelights on the subject were presented by Murray H. Shaw, Tocco Div., Ohio Crankshaft Co., at a **Tulsa** meeting.

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Some 56 members of the **Terre Haute** Chapter toured the Breed Plant of the Indiana & Michigan Electric Co. during the first plant tour of the current season.

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Use of metals and associated fabrication techniques in the production of Titan missiles were reviewed at a **St. Louis** meeting by Richard D. Masteller, supervisor of the Metals Unit, Materials Engineering Section, Martin-Denver Co.

THE STUDENTS NIGHT MEETING *in Cincinnati featured a talk on "Explosive Forming" by Louis Zernow, Aerojet-General Corp., who is shown, center, with Walter Koshuba, chairman, and James Hunt, chairman of the University of Cincinnati Student Group*

Quality vs. Production—Where to Draw the Line?

The problem of relating material quality to service requirements of the product was discussed at **Chicago** by John P. McCune, director of process control, Republic Steel Corp., and Bernard Hirst, manager of technical service, Taylor Forge and Pipe Works.

Mr. McCune described common surface and internal defects which may be found in steel, traced their possible origin and outlined means of detecting and correcting these faults. By application of proper plant controls, laboratory research and education of personnel, quality material can be produced consistently. A variety of inspection methods is available to assist in obtaining steel of any desired quality level from merchant bar to aircraft. Since earning a profit is a responsibility of the producer, the degree and cost of inspection must be compatible with service requirements of the product. Customer specifications are sometimes overly restrictive with respect to chemical requirements, cleanliness, etc., and results in unduly high rejection and increased costs. In summary Mr. McCune pointed out that the producer tries to make a high quality steel and, with knowledge of the end use, decides how far it is necessary to go to obtain a material suitable for the use intended.

Gary Greenberg, Bell and Howell Co., technical chairman, Bernard Hirst, speaker, J. H. Greenberg, chairman, and John McCune, speaker, at a meeting of the Chicago Chapter

Mr. Hirst stressed the importance, from the consumer's outlook, of material reliability during fabrication as well as in the finished product. The usual means of obtaining desired quality is through the medium of specifications and various features such as limits on inclusions, chemistry, heat treatment response, inspection, etching characteristics, etc. Requirements in specifications are frequently little more than words, vague in their meaning, and implying rather than spelling out what is desired. There is a great need for better defined requirements in many specifications and the practice of the aircraft industry in striving for this goal was commended. Spelling out the necessary quality level for a specific application requires collaboration between the producer and consumer. This practice permits a rational decision as to possible use of substandard material or the diversion to other uses. Mr. Hirst pointed out that, while specifications are usually designed to protect the buyer, a poor specification can be dangerous or may even result in higher cost steel if the requirements are too encompassing. *(Reported by E. A. Sticha)*

Materials for Helicopters

Since helicopters are completely assymetric devices, the largest material problem is fatigue, Ellis B. Kuhns, Hiller Aircraft Corp., reported at a **Golden Gate** meeting. Such fatigue results from cyclic stresses of frequencies that are multiples of main rotor, tail rotor or engine rpm.

Mr. Kuhns discussed the principal stresses encountered in various critical parts of the structure. He enumerated the materials used in these critical spots and pointed out specific problems that had arisen in past performances.

The main rotor is subject to high centrifugal and radial loads. Bending stresses are important but the centrifugal forces act to stiffen the rotor in flight. The main spar is 4130 steel of brazed construction with an aluminum trailing edge bonded to it. Low notch sensitivity is very important as it is practically impossible not to incur damage in the form of nicks and scratches from stones and pebbles and collision with birds. Wood has been successfully used in the past, but has been generally supplanted because of balancing problems due to moisture pick-up upon aging.

Centrifugal loads are transmitted to the main fork by tension-torsion bars. These bars are made up of laminated strips of cold worked stainless. They must be flexible enough in torsion to allow change of pitch and stiff enough in tension to prohibit outward movement of the rotor blades. Thrust bearings are being contemplated for future applications. The main fork itself is now 4130 steel but a change to 4335-V will be made on new models.

The main rotor shaft is another critical part. It must carry 90% of the rated power of the engine. In addition, bending stresses may be extremely large. Thus the main shaft acts like a large rotating beam fatigue test. Fillet radii are large, but the shaft must be slotted for control devices. In addition chromium plating is used on bearing surfaces (all parts of the shaft to be plated are shot peened).

The transmission must stand up to stresses not found in other applications. It must carry 80% of the power for 90% of the time. Gearing has been largely 4620 but late model transmissions use modified Krupp steel in the gears. The transmission and rotor shaft have had to keep pace with design changes which increased horsepower from 178 to 305. The gross weight of the same type has risen from 2250 to 3100 lb.

The landing gear on some helicopters is designed to yield slightly under high loads. With this type of behavior, the maximum use of material can be effected. In line with programs for lighter, more reliable structures, designs favoring forgings over castings are being used.

Mr. Kuhns concluded with a short film tracing the evolution of helicopters and many of their uses as well as new developments. *(Reported by Thomas M. Coulter)*

Distortion in Heat Treating

An "atmosphere of cooperation" is needed in the metalworking industry to minimize distortion during heat treating stated Norman Kates, chief metallurgist, Lindberg Steel Treating Co., when he spoke at **Rockford** on "Minimizing Distortion in Heat Treating". Many heat treating problems could be eliminated in the planning stage of a product if the designer, engineer and metallurgist would get together and pool their talents to improve the design and select the material with the heat treating requirements in mind.

A poorly designed part with unbalanced sections will undergo simultaneous expansion and contraction during heat treatment. Extremely high stresses are built up within the part that frequently cause the part to crack or fail completely. If the material selected for a part has a high "warpage factor" at the heat treating temperature, excessive shrinkage or growth will be experienced, making it impossible to hold dimensions. When the metallurgist encounters these problems during the heat treating process he is limited in what he can do to salvage the part.

The correct furnace atmosphere is also essential to minimize distortion. For example, surface decarburization of a part can cause differential stresses to be set up and precipitate surface cracking.

Proper fixturing of parts in the furnace will often reduce distortion. To obtain uniformity of product, uniform fixturing will be required. Trial and error methods of fixturing are often the only way to solve particular distortion problems. When distortion is encountered and the part must be straightened, Mr. Kates suggested straightening within the Ms-Mf temperature range for best results.

Specially designed furnaces and plenty of ingenuity are often required to cope with a specific heat treating problem. Lindberg Steel Treating Co. recently met the challenge of the space age when they designed and built a gantry furnace to heat treat rocket motor casings for the Minuteman and Polaris missiles. These rocket motor casings require precise temperature control and uniformity, as well as an accurately controlled atmosphere and complex fixturing, to insure distortion-free heat treating. *(Reported by Dale A. Zeal)*

Machining for Aerospace Vehicles

Cumulative data relative to the machining of ultra-hard steels and refractory metals resulting from research programs conducted by Metcut Research Associates Inc. was presented to the **Chicago-Western** Chapter by Michael Field, president and research director of Metcut. In addition to the martensitic low-alloy steels, hot work die steels, stainless steels, nickel, cobalt and titanium-base alloys, data was presented on tungsten, tantalum and molybdenum.

The principal uses of these metals in the aerospace industry were pointed out by several slides illustrating machined parts, such as nozzle inserts and rocket cases. In these parts, machining operations included milling (face and end), drilling, tapping, turning and grinding, each of which required evaluation of many variables before a suitable product was produced.

Oliver S. Spark, Chicago-Western chairman, Michael R. Field, Metcut Research Associates, Inc., who spoke on "Machining for Aerospace Vehicles", and Michael V. Nevitt, program committee chairman, at a recent meeting

It was shown that an empirical approach to the problem of machining a given alloy was necessary because of the many variables present in machining operations. This was particularly true in these alloys because of a lack of information with regard to the essential basic parameters.

A "cutting spectrum" was presented, consisting of a plot of tool life versus cutting speed which showed the position of each alloy in the series for turning, milling, drilling and tapping.

Each alloy within the cutting spectrum has its own characteristics, depending upon other major variables, such as type of tool (carbide or high-speed steel), cutting fluid, feed, depth of cut, etc. Each of these variables can give a separate set of data when evaluating tool life versus cutting speed for given conditions.

After presenting the machining test results, further data on the effect of tool wear and cutting conditions on distortion were discussed. It was shown that the amount of distortion, expressed as a change in deflection over a given gage length, increased as the amount of tool wear increased. In the grinding process distortion is a function of grinding wheel hardness, wheel speed, depth of cut per pass and grinding fluid. Reduced wheel speeds and light depth per pass are especially effective in minimizing grinding distortion.

The meeting ended with a distribution of a set of tables prepared by Metcut giving recommended conditions for machining the ultra-hard steels and refractory metals which had been discussed.—*(Reported by John A. Horwath)*

CORRECTION

The correct title of the Honorable Mention Award won by William C. Coons, Lockheed Missile and Space Co., in Class 6 of the Metallographic Awards, listed on p. 15, November Metals Review, *should have read "A Group of Electrolytically Polished Metals", rather than "Tungsten and Tungsten-Carbide Powders"*

Sorry, Mr. Coons!

HIGH-PURITY METALS *were discussed at an Indianapolis meeting by Kenneth E. Benson, Bell Telephone Laboratories. Shown are, from left: Charles C. Patton, senior staff engineer, metallurgy, Western Electric Co. Inc., Mr. Benson, and George F. Sommer, chairman*

THE 1961 NEWLY ELECTED MEMBERS *of Alpha Chapter, Alpha Sigma Mu honorary metallurgical fraternity, Michigan College of Mining and Technology are, back, from left: William J. Locher, William C. Wahl, Jeff W. Butwell, Richard M. Soltis, Mark F. Miller, Robert S. Ray and Donald L. Poikonen. Front, from left: Harold W. Pauly, Thomas G. Oakwood, Allen D. Ackerman, John N. Johnson, Clyde D. Calhoun, Verl C. Asmund and John A. McComb. Also elected but not shown were David A. Byfield, James W. Erickson, John P. McKay, Bruce C. Peters, Richard D. Stonmark and George E. Tardiff*

LEADERS PICTURED AT A MEETING *in Worcester are, from left: Ralph N. S. Merritt, Jr., secretary-treasurer, Gregory J. Shandrick, executive committee, Stephen J. Carmody, meeting committee, Gordon T. Rideout, vice-chairman, Paul J. Lisk, executive committee, and Francis E. Kenedy, chairman. Articles which men are holding were among many donated by company members of the Chapter for distribution to those attending the meeting*

Chapter Meetings for January

Jan. 3

Columbus—Christian Church. R. E. Maringer . . . Metallurgy in Semiconductors

Jan. 5

Ontario—Fischer Hotel. W. B. F. Mackay . . . Steels in 1970

Jan. 8

Cedar Rapids—Roosevelt Hotel. J. S. Alyea . . . Industrial Applications for Structural Adhesives

Chicago—Dohl's Morton House. Challenge of Nonferrous Alloys to the Steel Industry

Cleveland—Hotel Manager. W. F. Brown, Jr., . . . Cryogenics

Detroit. Frank M. Richmond . . . Recent Developments in Stainless Steels

Indianapolis—Athenaeum Turners Club. R. L. Mogel . . . Toolsteels—Their Use and Misuse

Montreal—Queen Elizabeth Hotel. Forging Facilities

New York—Brass Rail Restaurant. Donald B. Howard . . . Advances in Cold Forming of Metals

Rochester—Triton Party House. Danial Beard . . . Jet Air Travel Brought Up-to-Date

Washington—American Association University of Women. S. N. Stupar . . . Soviet Metallurgy

Jan. 9

Hartford. Warren F. Savage . . . New Developments in Welding

Mahoning Valley—Mural Post Room. T. L. Myron . . . Agglomeration of Iron Ore

Mohawk Valley—Trinkaus Manor. Joseph G. Jackson . . . What the Metallurgist Should Know About Patent Law

Muncie. Arthur R. Lindgren . . . Nondestructive Testing Methods

Penn State. Frank Garofalo . . . Resistance to Creep Deformation and Fracture in Metals and Alloys

Saginaw Valley—High-Life Inn. Stanley Rouze and William Grube . . . Study of High-Temperature Transformation in Metals by Therminonic Emission Microscopy

San Diego. Paul Harper . . . Electroforming

Texas. Karl L. Fetters . . . New Developments in Steelmaking

Tri-City—Blackhawk Hotel. H. T. Francis . . . Fundamentals of Corrosion

Jan. 10
Dayton—Engineers Club. A. O. DeHart . . . Bearings—Some Fundamentals on Selection and Application
Notre Dame—Capri Restaurant. Thomas J. Hugel . . . Thermo-Electric Alloys—New Area of Metallurgical Research
Worcester—Nicks Colonial Grill. Vacuum Melting Vs. Air Melting
York. W. J. Camerford . . . Corrosion and Corrosion Resistance

Jan. 11
Northeast Pennsylvania—Host Motel. Abrasive Machining
Pittsburgh. Dr. G. R. Fitterer

Jan. 15
Baltimore—Engineers Club. W. A. Pennington . . . Diffusion and Transport of Carbon in Ferrous Metals
Chicago-Western—Old Spinning Wheel. M. E. Fine and J. B. Cohen . . . Why Materials Science
Miami—Park Lane Cafeteria. Mr. Stretmater . . . Aging and Hardening of Aluminum
New Jersey—Essex House. R. M. Fisher . . . New Developments in Electron Metallography

Jan. 16
Louisville. R. J. Raudebaugh . . . Research and Development in Austenitic Stainless Steels
Purdue. Panel . . . High-Temperature Corrosion

Jan. 17
Long Island—Carl Hoppls Restaurant. George H. Robinson . . . Metallurgy in the Automotive Industry
Oak Ridge—Holiday Inn. A. P. Fraas . . . Future Nuclear Reactor Designs

Jan. 18
Carolinas Northern Piedmont—Banners Restaurant. Harry Schwartzbart . . . New Developments in Welding

Jan. 24
Minnesota—Calhoun Beach Hotel. K. L. Quigley . . . Inspection
Rockford. Kenneth Mack . . . Adhesive Bonding in Automotive Manufacturing

Jan. 25
Boston—MIT Faculty Club. Panel . . . New Laboratory Techniques

Jan. 26
Philadelphia—Engineers Club. J. L. Everitt . . . Engineering and Material Problems of Peach Bottom Reactor

An Evening in South Africa

Impressions of a recent visit to the Union of South Africa were given at a meeting of the **Ottawa Valley** Chapter by John Convey, director of the Mines Branch, Department of Mines & Technical Surveys and National Trustee ASM. Dr. Convey spent two months in South Africa and Rhodesia earlier this year as Head of the Canadian Delegation to the Seventh Commonwealth Mining and Metallurgical Congress.

A vivid description of this country, which is mainly unknown to North Americans, was given. The almost ideal climate provides very favorable conditions both for mining and agriculture—almost anything will grow abundantly. Despite the enormous wealth of the country, only a small favored section of the population reaps any benefit, namely the whites. One could not visit South Africa without immediately sensing the growing discontent among the colored people who are kept subservient within view of the wealth of the whiteman. The Government is making efforts to improve the lot of the colored people but from the natives' point of view this isn't enough.

John Convey, National Trustee ASM, at Ottawa Valley where he gave his "Impressions of a Recent Visit to South Africa"

The mineral wealth of South Africa is immense. High-grade ores of iron, copper, nickel, chromium and zirconium are abundant, not forgetting coal, gold and diamonds. For the most part these minerals are readily mined. The mining industry is very progressive and uses modern techniques and the maximum amount of mechanization. Hand labor is kept to a minimum. These features result in production of ores at very low costs; for instance, coal at the pithead for 50¢ a ton.

The mining industry has contributed generously to medical research which has resulted in the virtual defeat of malaria and sleeping sickness so prevalent a few years ago. The mining industry has also done a great deal to improve the living standards of the workers.

A great deal of research is being carried out in South Africa with the very best in facilities and competent staff, financed generously both by Government and industry. It is felt that this progressive approach to research has been mainly responsible for the rapid growth in the South African economy in the past 30 years. *(Reported by J. Pargeter)*

Jet Age Metallurgy

Jet turbine blade manufacture and the testing done in the production of these parts were described by Carl Stein, supervisor of laboratories for Thompson-Ramo-Wooldridge Corp., at a meeting in **York.**

The extensive examination performed on the metals used included surface studies by acid etching, eddy-current die pentrant, studies for internal defects such as pipe and inclusions, chemical analysis by wet chemistry, spectrography and electronic methods, microstructure, forgeability and stress-rupture testing at elevated temperatures. The combined use of the "twist test" for formability, along with examination of the microstructure, give proper procedures for forging of the alloys used in the turbine blades. Plots of the inter-relationship of grain size, stress-rupture, ductility and forgeability were shown and discussed.

Mr. Stein outlined some of the "in-production" testing, including studies on configuration, material reduction and die usage. Various lubricants in use or being studied were grouped generally as graphitic or ceramic.

The final product is tested or examined by flow pattern studies, microstructure for grain size and possible intergranular attack or alloy depletion, bend tests and finally engine operational testing. The engine builders work on the minimum figure at which the parts will survive, not the average or maximum; therefore, testing must be made accordingly. *(Reported by M. L. Bodnar)*

What the Metallurgist Can Do for Management

In a discussion in **Richmond** on the contributions that a metallurgist can make to industrial management, George H. Robinson, supervisor, metallurgical engineering department, General Motors Research Laboratories, examined the worth of the profession in light of five main topics.

Intelligent Trouble Shooting

An intelligent metallurgical appraisal of a problem will determine whether failure is due to incoming material quality, faulty processing by the vendor, misuse in service, or combinations of these. Microscopic examination can reveal telltale signs which lead to the answer. Microscopic surface ruptures can often be traced to processing variables, such as piercing and drawing, and appearance of the microstructure yields clues about the quality of the heat treatment cycles and temperatures, as well as service conditions.

Preventive "Bird-Dogging"

This approach helps reduce process scrap and is an important function of the metallurgist, who must be alert in applying preventive measures to process variables which would reduce the quality level. In this area, the metallurgist meets perhaps the greatest opposition from production management at the lower levels, when the changes in process variables, although intended to increase the output, reduce the quality to unacceptable levels.

Application of Testing Methods

A well-devised test measures the performance of materials under various service conditions. Mr. Robinson mentioned the usefulness of the Jominy hardenability test in predicting the heat treated properties obtainable from a heat of steel. He also mentioned a spot test, developed by GMR, which, by using a few chemicals, indicates the chromium content at the surface of stainless steel, an important factor from a finishing and corrosion standpoint.

Another test designed to accelerate the testing period, as well as to duplicate atmospheric oxidation conditions, is a cyclic humidity test used at GMR for testing low-alloy sheet steels destined for rocker panel sections. It was designed specifically to duplicate the type of nonprotective oxide layer which is formed in service, and the correlation between acceptance testing and service has been satisfactory (and a long-range test has been shortened to only three weeks). A wear test setup was mentioned as an example of judicious use of testing methods. It was desired to find optimum tappet and cam shaft material combinations for minimum of wear in service. A simple rig was devised around a tappet and a cam shaft in the laboratory and instrumented. A fleet test of one year's duration was used as control and it was found that by this expedient, the test yielded results with excellent correlation with actual service in only four days. The same device was further used in testing crank case oils with similarly good results.

Shown at a Richmond meeting are T. S. Daugherty, chairman, G. R. Robinson, speaker, Jerry A. Burke, Jr., past chairman, and S. J. Sansonetti, treasurer

Development of New Materials

Here is another field where the metallurgist can be of immense aid to management. A striking example of this, and a familiar one, is the development of the National Emergency Steel series to save critical materials. The metallurgists at GMR have developed malleable cast iron that can be cast in section thicknesses up to 5 in. for crankshaft applications. GMR-235, a superalloy developed during the Korean War, allows turbine buckets to be cast rather than forged.

Working With Production

In a competitive industry, cutting production costs is a continuous process. A metallurgist is in a good position to contribute to cost saving methods in an industry utilizing large volumes of metal. Here, as well as in the other areas where he can contribute to management, his job is to communicate and convince management of the steps necessary to insure quality and reduce costs. He will have to be a good salesman for his ideas in order to contribute to management to his fullest capacity. *(Reported by Auvo I. Kemppinen)*

Progress in Powder Metallurgy Techniques

"New Powder Metallurgy Techniques" was the subject of a talk given by Henry H. Hausner, consulting engineer and adjunct professor at the Polytechnic Institute of Brooklyn, at a **Cincinnati** meeting.

Dr. Hausner reviewed the types of powders, including ultra-fine, spherical and coated, as well as the methods of compacting the powders by application of pressure or without pressure.

The importance of fine powders to the solid state reactions to form alloys was shown with the uranium-zirconium system where alloying was achieved below the melting point of either alloy. The temperature at which the alloying begins is lower with the finer powders and alloying completed sooner than with coarser particles.

Compacting powders by application of pressure may be accomplished by unidirectional pressure, with single action pressure, double action pressure with floating die, or double action pressure with controlled die body movement; isostatic pressing; explosive forming of

powders; powder rolling; extrusion of powders with or without containers; and swaging of powders.

The forming of powders without application of pressure is accomplished by loose powder sintering, vibratory compacting and slip casting.

Sintering of loose powders is an excellent example of powder metallurgy which holds excellent potential for applications. For example, beryllium, which requires very carefully controlled processing to produce acceptable levels of ductility in two directions, was reported as having been sintered from loose powders to 98% density, in England, with the resulting material ductile in *three* directions! The indications are that a material of entirely different properties could be obtained.

The proper mixture of coarse and fine powders results in densities of greater than 90% with vibratory compacting at 10-50 cps. for 5 min. Vibratory compacting prior to extrusion presents many interesting possibilities and much work is needed to advance vibratory compacting technology.

Dr. Hausner pointed out that, to his knowledge, there has been no systematic work on slip casting of metal powders. Fourteen basic variables must be resolved if we are to convert this ceramic process to metal powders.

Slip casting is attractive in that inexpensive plaster molds are used to obtain complicated or hollow shapes. The metal powders are able to move readily as friction (encountered in pressing of powders) is overcome by the lubricating effect of the carrier fluid.

Dr. Hausner concluded by stressing the need for carefully planned additional work in the laboratory to better understand the phenomena involved in the various powder metallurgy processes. *(Reported by William M. Garcia)*

The Whys of Electroplating

Because electroplating comes under the control of the metallurgist in many companies, Harry Sanders' talk, "What the Metallurgist Should Know About Electroplating", was of special interest at a **Springfield** meeting. Mr. Sanders is district sales manager for Enthone, Inc.

The standard salt spray test and several of its modifications were described in connection with the problems of corrosion and the evaluation of corrosion resistance. The merits of a standard 20% NaCl solution, a 5% salt spray solution with a pH maintained at 6.5 to 7.2, a salt spray solution with a pH maintained at 3.2 to 3.5 by the addition of 1% acetic acid, and the CASS (copper chloride salt spray) test were explained.

Although the value of the salt spray test is questioned by some people in the electroplating field, it is a good comparative test of practical value. The CASS test, one of the modifications of the standard salt spray test, holds a good relationship with actual field corrosion.

Another test which compares well with actual field corrosion is the Corrodkote test in which a synthetic soil composed of cupric nitrate, ferric chloride and ammonium chloride in a kaolin base is applied in paste form to the parts to be tested. After exposure to a constant humidity of about 90% at approximately 100°F. for a specified time, the test specimen is examined and evaluated.

The great misuse of the salt spray test comes from trying to correlate its results with service life. Since the corrosion rates of ferrous and nonferrous articles vary considerably in different atmospheres and localities, such a correlation is difficult to make. The development of the CASS and Corrodkote tests represents an effort on the part of the metal finishing industry to make such a comparison more realistic.

Another phase of the plating industry where much progress is being made is in the improvement of the primary distribution characteristics of an electrodeposit. That the current goes to the edges and corners of a piece of work first is a well known fact. The resulting plate does not fill in the voids and scratches but actually accentuates the surface imperfections. The introduction of so-called leveling baths is changing this now.

Leveling is defined as the ability of a plating bath to produce deposits relatively thicker in small recesses and relatively thinner on small protrusions, with an ultimate decrease in the depth or height of small surface irregularities. As a consequence, many buffing operations can be minimized or eliminated.

Experimental studies of bright nickel plating baths have shown that the primary cause of leveling is the organic addition agent combinations added to the solution. In the presence of these agents the degree of leveling is controlled by the operating conditions. Increased leveling is obtained with an increase in current density, a decrease in temperature and an increase in agitation.

Also discussed were duplex chromium plating, plating on aluminum and magnesium and the use of electroless baths. The field of electroplating is becoming more complex with demands for gold, silver or alloy coatings on metals such as beryllium copper, bronze or brass. Many varieties of stainless steel alloys must be adherently plated to meet special service requirements. Even such passive materials as Inconel, Hastelloy, titanium, zirconium and beryllium sometime require plated coatings. *(Reported by Douglas Dean)*

"NEW DEVELOPMENTS IN TOOLSTEELS" *were discussed by George A. Roberts, Vanadium-Alloys Steel Co., at Rochester. Vice-chairman Robert Adair, left, and chairman Robert Barrow, right, congratulate Dr. Roberts*

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Many of the papers accepted by the Committee will be scheduled for presentation at the 44th National Metal Congress and Exposition; however, publication of a paper does not necessarily infer that it will be presented at the Society's Convention.

Manuscripts in triplicate, plus one set of unmounted original photographs and original tracings should be sent to the attention of John Parina, Secretary, Transactions Committee, American Society for Metals, Metals Park, Ohio. Detailed instructions for preparation of papers for Transactions Quarterly are available on request.

Transactions Quarterly is available to ASM members at an annual subscription rate of $3 (non-member subscription rate $10 per year).

dry. Extensive experience in all phases of foundry and casting industry. Considerable experience in technical phase of customer relations. College graduate, publications, age 45. Resume. Available immediately. Box 12-30.

METALLURGICAL ENGINEER: M.S. degree, age 33, married. Six years applied research and development of heat and corrosion-resistant stainless steels, nickel and tantalum alloys. Two years liaison assignment in Europe covering air weapon materials development and production. Desires responsible position in product development or technical services. Resume on request. Box 12-35.

METALLURGIST: Age 44. Eight years' experience with large alloy steel company, 3 years as metallurgist for screw company, 8 years in casting and heat treating permanent magnets. Experienced supervisor with good background in ferrous metallurgy. Desires supervisory position, Midwest. Resume Box 12-40.

CHIEF METALLURGIST: B.S. degree, graduate studies in management, 18 years' experience in steel processing and development activities. Desires position in manufacturing, liaison or technical sales. Box 12-45.

METALLURGICAL ENGINEER: Male, age 25, B.S. degree from Carnegie Tech, military obligations fulfilled. Past employment, one year in alloy steel and shipyard. Willing to travel. Desires position in customer contact work or sales engineering. Will forward resume on request. Available immediately, prefer the alloy steel industry. Box 12-50.

PHYSICAL CHEMIST: Ph.D. degree, senior research metallurgist. Original filler metal phase diagrams, special brazing and soldering alloy developments, 20 technical and scientifical papers, 3 years of academic and 20 years' industrial experience. Desires research and development in metal joining. Resume. Box 12-55.

METALLURGICAL ENGINEER: M.S. degree, age 38. Ten years' diversified experience in alloy development and materials application. Thorough practical background in fabrication and processing of high-temperature resisting alloys, steels and nonferrous metals. Fluent in French and German. Desires position with growth potential. Box 12-60.

METALLURGIST: Carnegie Tech graduate. Experienced in organization contacts, development, production, fabrication, inspection, statistical analysis, preparation of bids, specifications, reports for publication. Background includes all ferrous metals and titanium, Zircalloy, aluminum, uranium, cermets and ceramics, U.S. and Europe. Dynamic, cost conscious. Prefers smaller, progressive company without age barriers. Box 12-65.

METALLURGICAL ENGINEER: M.S. degree, mid-30's, married, family. Excellent progress toward MBA degree. Ten years' supervisory level experience in applied research and development of ferrous and nonferrous metals. Physical and mechanical metallurgy directed toward metalworking and applications. Excellent experience in planning, organizing, controlling and evaluating metal processing techniques. Desires responsibility requiring technical leadership and administration. Box 12-70.

METALLURGIST: Recent M.S. degree in metallurgy, 12 years' diversified experience in applied research and development and trouble shooting, heat treating, welding, cold and hot forming, casting, etc., of ferrous and nonferrous materials, including toolsteels; establishment of metallurgical production control standards. Purchase specifications of materials and equipment. Investigation of product failures, liaison between production and designer selection of optimum materials in terms of 3 M's (metallurgical, manufacturing and mechanical) requirements. Box 12-75.

MATERIALS LIAISON ENGINEER: B.S., M.S. degrees in metallurgical engineering. Five years' experience in the development of Cb, Ti, Mo, W, and high-temperature alloys, also customer contact experience as sales engineer. Seeks position as a liaison engineer or senior physical metallurgist with a firm in the aerospace industry. Box 12-80.

METALLURGIST-CERAMIST: Age 35. Experienced in research and development of electronic and nuclear metals and ceramics, teaching. Licensed professional engineer, would like responsible and challenging position. Diversified experience in special laboratory analysis techniques. Box 12-85.

METALLURGICAL SALES ENGINEER: Engineering degree with 16 years in sales and development of uses for metals, alloys, ceramics, chemicals and refractories in the steel and foundry industry. Chicago area. Resume on request. Box 12-90.

METALLURGICAL ENGINEER: Twenty years' experience covering steel manufacturing research, metallurgical control in heavy forming industries and general advance manufacturing. Experienced in all steels, superalloys, refractory metals, titanium. Time in responsible management positions has produced mature viewpoint, broad outlook, ability to organize effort and accomplish long-range goals. Seeks challenging opportunity with growth potential, preferably Southwest or West Coast. B.S. degree, age 42, professional engineer. Box 12-95.

RESEARCH IN METALLURGY

Several positions for metallurgical research engineers have been created by an expansion in TAPCO's Materials Technology Group.

This group is involved in supplying state-of-the-art information on advanced materials applicable to a wide range of missile and space projects.

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- To develop processing requirements and specifications for metallic materials used in rocket-nozzle and power-generation devices for space and missile applications.
- To perform research and development on high-temperature plastics related to insulating, heat and ablation-resistant and fiber-reinforced materials for high-thrust rocket-nozzle applications.

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R. J. Theibert, *Manager Materials Staffing*

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The man must have a sound education in fundamental metallurgy with in-plant experience in powder metallurgy. This is an excellent opportunity for an aggressive young man with ability who wants to grow with a progressive concern. Salary open. Location, Midwest. **Box 12-100, METALS REVIEW.**

the 3 minute glass

There are a couple of tributes to technical and professional societies that have appeared within the past year or so that I would like to share with you.

In a sense ASM is both a "technical" and a "professional" society, depending on the breadth of definition. ASM is a *technical* society in that it is primarily oriented to the technical content with which it deals and does not require adherence to education or registration standards to qualify for membership in the society.

On the other hand ASM is a *professional* society in the sense that it does provide a forum for the interchange of ideas, a common meeting ground for industry, education and government, and for men and women in metals research, production and engineering. Other attributes of ASM's professional personality are its continuing interest in bringing recognition to the field of metals engineering, the career development of its technician, engineering and research members, and the fostering of interest in metals as a field of endeavor for our young people.

An editorial in the "AB Metal Digest," published by Buehler, Ltd., states that " . . . it is not a coincidence that in general the leaders in our profession are those who have taken the time and trouble to be active in professional society affairs".

"There are many advantages", continues the editorial referring to participation in society activity. "First, our work is a large, important part of our lives and therefore we must take all opportunities to increase our proficiency. Professional friendship is an outgrowth of such societies. The pooling of knowledge at a social level offers many rewarding hours of enjoyable entertainment. The meetings give one an opportunity to hear the highest caliber speakers—those who are specialists in their field. The finest written and edited periodicals are at your disposal. With this day of specialization even within one's given field, we owe it to ourselves to broaden our knowledge to the point of at least being aware of related advancement in our field.

"The recognition achieved by the author of printed contributions or the holder of official positions creates professional prestige and inward gratification.

"As a metallurgical laboratory house we are particularly interested in the American Society for Metals and are also affiliated through memberships with many other domestic and foreign organizations devoted to our common interest. Such affiliations provide the highest benefit to the members and their companies as well".

ASM member, Dr. Gerold Tenney, a member of the Los Alamos Chapter, points out, in referring to the 1960 Christmas message of Todd Shipyards Corp., that " . . . the fundamental philosophy of such a large company as Todd definitely strengthens confidence in the thinking of the progressive members of American industry".

The message to which Dr. Tenney refers was issued by J. T. Gilbride, president of Todd, in three simple but eloquent paragraphs.

"We are mindful that at this holiday season", wrote Mr. Gilbride, "it is customary for many of us to remember our friends by some expression for what they have meant to us during the year.

"We at Todd are honoring this traditional custom in a manner which we believe you will approve. We are all aware of existing conditions in the maritime industry, and we feel that we can best convey to you our good will by increasing our support of professional and technical groups whose programs specialize in the training, research and development which will prove so valuable to the growth of our industry. In addition, we plan to continue our established scholarships in technical education".

And may we join with Mr. Gilbride's last paragraph as our wish, too:

"In the full spirit of the holiday season we extend to you our warmest wishes for a Merry Christmas and express our hope that you will enjoy good health and good fortune in the New Year."

Allan Ray Putnam
Managing Director

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Snowplow chews up avalanches at 36 tons a minute

How steel with Nickel in it delivers the brawn behind the bite

Chewing through mountainous drifts to rescue a snow-bound town, this plow can devour 2,200 tons of snow an hour.

It bites through solid ice and deep snow. Or strips a new-fallen six-inch blanket from a superhighway at 30 mph.

Drive shaft and gears run a gauntlet of shocks as the plow churns through rocks and stumps buried under stone-hard snow. That's one big reason why two nickel alloy steels, AISI 4320 and 3140, are used for these heavily stressed transmission parts.

Nickel gives steel the strength and toughness essential to a snowplow's drive shaft that must perform under brutal wrenching, twisting shock loads in arctic cold.

Putting stamina where it counts is just one of the things you can do with Nickel. In addition to providing muscle, Nickel can also help alloys withstand the intense heat generated by supersonic flight. Or shrug off the deep cold of liquid helium. And every industry knows the value of Nickel in combatting corrosion.

When you have a metal problem, look into the possibility that Nickel or one of its alloys might be the answer. Write for our "List A." It tells you of technical literature helpful to all industries. A copy is yours on request.

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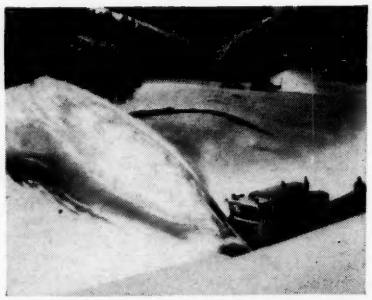

Transmission shafts are made of AISI 4320 nickel alloy steel. Drive and spline bushings are AISI 3140. Snowplow by American Snowblast Corp., Denver, Colorado.

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